(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 May 2002 (30.05.2002)

PCT

(10) International Publication Number
WO 02/43391 A1

(51) International Patent Classification[7]: H04N 7/16, G06T 7/00

(21) International Application Number: PCT/EP01/13453

(22) International Filing Date:
16 November 2001 (16.11.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/718,260 22 November 2000 (22.11.2000) US

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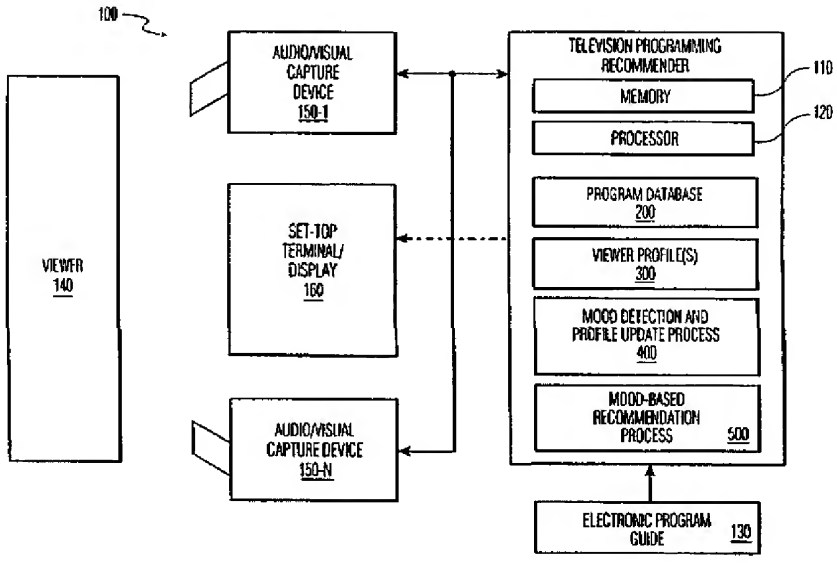
(81) Designated States *(national)*: CN, JP, KR.

(84) Designated States *(regional)*: European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND APPARATUS FOR GENERATING RECOMMENDATIONS BASED ON CURRENT MOOD OF USER



(57) Abstract: A method and apparatus are disclosed for generating a user profile in a recommendation system based on the current mood of the user. The present invention associates each session, such as a viewing session, with one or more current moods of the user. The present invention learns the user's preferences in accordance with various moods, and utilizes such mood-based viewing preferences to generate corresponding recommendations. In one implementation, an electronic programming guide is provided that allows a viewer to select one or more programs that the viewer is likely to find attractive, based on his or her current mood.

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Method and apparatus for generating recommendations based on current mood of user

Field of the Invention

The present invention relates to recommenders, such as recommenders for television programming or other content, and more particularly, to a method and apparatus for making recommendations, such as recommendations of television programs or other content, based on the current mood of the user.

Background of the Invention

The number of media options available to individuals is increasing at an exponential pace. As the number of channels available to television viewers has increased, for example, along with the diversity of the programming content available on such channels, it has become increasingly challenging for television viewers to identify television programs of interest. Historically, television viewers identified television programs of interest by analyzing printed television program guides. Typically, such printed television program guides contained grids listing the available television programs by time and date, channel and title. As the number of television programs has increased, it has become increasingly difficult to effectively identify desirable television programs using such printed guides.

More recently, television program guides have become available in an electronic format, often referred to as electronic program guides (EPGs). Like printed television program guides, EPGs contain grids listing the available television programs by time and date, channel and title. Some EPGs, however, allow television viewers to sort or search the available television programs in accordance with personalized preferences. In addition, EPGs allow for on-screen presentation of the available television programs.

While EPGs allow viewers to identify desirable programs more efficiently than conventional printed guides, they suffer from a number of limitations, which if overcome, could further enhance the ability of viewers to identify desirable programs. For example, many viewers have a particular preference towards, or bias against, certain categories of programming, such as action-based programs or sports programming. Thus, the viewer preferences can be applied to the EPG to obtain a set of recommended programs that may be of interest to a particular viewer.

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Thus, a number of tools have been proposed or suggested for recommending television programming. The Tivo™ system, for example, commercially available from Tivo, Inc., of Sunnyvale, California, allows viewers to rate shows using a "Thumbs Up and Thumbs Down" feature and thereby indicate programs that the viewer likes and dislikes, respectively. In this manner, the Tivo™ system implicitly derives the viewer's preferences from previous television programs that the viewer liked or did not like. Thereafter, the TiVo receiver matches the recorded viewer preferences with received program data, such as an EPG, to make recommendations tailored to each viewer.

Implicit television program recommenders generate television program recommendations based on information derived from the viewing history of the viewer, in a non-obtrusive manner. Explicit television program recommenders, on the other hand, explicitly question viewers about their preferences for program attributes, such as title, genre, actors, channel and date/time, to derive viewer profiles and generate recommendations.

While such television program recommenders identify programs that are likely of interest to a given viewer, they suffer from a number of limitations, which if overcome, could further improve the quality of the generated program recommendations. For example, conventional tools for generating television program recommendations consider a person's viewing history as a whole when generating a viewer profile and television program recommendation scores. Thus, the identified programs have no particular correlation to the current interests or mood of the viewer. A need therefore exists for a method and apparatus for generating television program recommendations that is responsive to the current mood of the viewer.

Summary of the Invention

Generally, a method and apparatus are disclosed for generating a user profile in a recommendation system based on the current mood of the user. The present invention thus learns the user's preferences in accordance with various moods, and thereafter utilizes such mood-based preferences to generate recommendations that are tailored to the current mood of the user.

The present invention detects the user's mood by processing audio or visual information, such as the facial expression of the user. Once the mood is detected, the behavior associated with a given session can be associated with the current moods of the viewer. In one implementation, the present invention provides an electronic programming

guide that allows a viewer to select one or more programs that the viewer is likely to find attractive, based on his or her current mood.

A more complete understanding of the present invention, as well as further features and advantages of the present invention, will be obtained by reference to the following detailed description and drawings.

Brief Description of the Drawings

FIG. 1 illustrates a television programming recommender in accordance with the present invention;

FIG. 2 illustrates a sample table from the program database of FIG. 1;

FIG. 3A illustrates a sample table from a Bayesian implementation of an implicit viewer profile of FIG. 1;

FIG. 3B illustrates a sample table from a viewing history used by a decision tree (DT) recommender;

FIG. 3C illustrates a sample table from a viewer profile generated by a decision tree (DT) recommender from the viewing history of FIG. 3B;

FIG. 4 is a flow chart describing an exemplary mood detection and profile update process embodying principles of the present invention; and

FIG. 5 is a flow chart describing an exemplary mood-based recommendation process embodying principles of the present invention.

Detailed Description

FIG. 1 illustrates a television programming recommender 100 in accordance with the present invention. As shown in FIG. 1, the television programming recommender 100 evaluates each of the programs in an electronic programming guide (EPG) 130 to identify programs of interest to one or more viewer(s) 140. The set of recommended programs can be presented to the viewer 140 using a set-top terminal/television 160, for example, using well known on-screen presentation techniques. While the present invention is illustrated herein in the context of television programming recommendations, the present invention can be applied to any automatically generated recommendations that are based on a behavior history, such as a viewing history or purchase history.

According to one feature of the present invention, the television programming recommender 100 generates a user profile 300, discussed below in conjunction with FIGS. 3A and 3C, based on the current mood of the viewer, in addition to the more conventional

viewing behavior of the viewer. While a conventional recommender considers a person's viewing history as a whole when generating a viewer profile, the present invention treats the viewer's preferences as a multi-class problem, and associates each viewing session with one or more current moods of the viewer. Thus, the present invention learns the viewer's preferences in accordance with various moods, and utilizes such mood-based viewing preferences to generate program recommendations. In this manner, an electronic programming guide is provided that allows a viewer to select one or more programs that the viewer is likely to find attractive, based on his or her current mood.

As shown in FIG. 1, the television programming recommender 100 includes one or more audio/visual capture devices 150-1 through 150-N (hereinafter, collectively referred to as audio/visual capture devices 150) that are focused on the viewer 140. The audio/visual capture devices 150 may include, for example, a pan-tilt-zoom (PTZ) camera for capturing video information or an array of microphones for capturing audio information, or both.

The audio or video images (or both) generated by the audio/visual capture devices 150 are processed by the television programming recommender 100, in a manner discussed below in conjunction with FIGS. 4 and 5, to identify one or more predefined moods of the viewer 140. As discussed below, facial expression processing techniques may be employed to analyze the face of the viewer to detect, for example, if the viewer is happy or sad. In addition, audio processing techniques may be employed to analyze sounds made by the viewer to detect, for example, laughing or crying, which may suggest the current mood of the viewer. The mood of the viewer may be detected, for example, when profile information is recorded, or when a recommendation is about to be generated (or both).

As shown in FIG. 1, the television programming recommender 100 contains a program database 200, one or more viewer profiles 300, a mood detection and profile update process 400 and a mood-based recommendation process 500, each discussed further below in conjunction with FIGS. 2 through 5, respectively. Generally, the program database 200 records information for each program that is available in a given time interval. One illustrative viewer profile 300, shown in FIG. 3A, is an implicit viewer profile that is typically derived from the viewing history of the viewer, based on the set of programs that the viewer liked or disliked. Another exemplary viewer profile 300', shown in FIG. 3C, is generated by a decision tree recommender, based on an exemplary viewing history 360, shown in FIG. 3B.

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The mood detection and profile update process 400 processes the video or still images (or both) generated by the audio/visual capture devices 150 to sense the current mood of the viewer and to learn the viewer's preferences when in such a mood. The mood-based recommendation process 500 utilizes the mood-based viewing preferences developed by the mood detection and profile update process 400 to generate program recommendations based on the derived current mood of the viewer.

The television program recommender 100 may be embodied as any computing device, such as a personal computer or workstation, that contains a processor 120, such as a central processing unit (CPU), and memory 110, such as RAM and/or ROM. In addition, the television programming recommender 100 may be embodied as any available television program recommender, such as the Tivo™ system, commercially available from Tivo, Inc., of Sunnyvale, California, or the television program recommenders described in United States Patent Application Serial No. 09/466,406, filed December 17, 1999, entitled "Method and Apparatus for Recommending Television Programming Using Decision Trees," (Attorney Docket No. 700772), United States Patent Application Serial No. 09/498,271, filed Feb. 4, 2000, entitled "Bayesian TV Show Recommender," (Attorney Docket No. 700690) and United States Patent Application Serial No. 09/627,139, filed July 27, 2000, entitled "Three-Way Media Recommendation Method and System," (Attorney Docket No. 700913), or any combination thereof, as modified herein to carry out the features and functions of the present invention.

FIG. 2 is a sample table from the program database 200 of FIG. 1 that records information for each program that is available in a given time interval. As shown in FIG. 2, the program database 200 contains a plurality of records, such as records 205 through 220, each associated with a given program. For each program, the program database 200 indicates the date/time and channel associated with the program in fields 240 and 245, respectively. In addition, the title, genre and actors for each program are identified in fields 250, 255 and 270, respectively. Additional well-known features (not shown), such as duration, and description of the program, can also be included in the program database 200.

FIG. 3A is a table illustrating an exemplary implicit viewer profile 300. As shown in FIG. 3, the implicit viewer profile 300 contains a plurality of records 305-313 each associated with a different program feature. In addition, for each feature set forth in column 330, the implicit viewer profile 300 provides the corresponding positive counts in fields 335 through 345, and negative counts in field 350. According to a feature of the present invention, a positive count is provided for each distinct mood that is detected by the

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television programming recommender 100. The various positive counts indicate the number of times the viewer watched programs having each feature while in the corresponding mood. The negative counts indicate the number of times the viewer did not watch programs having each feature.

For each positive and negative program example (i.e., programs watched and not watched), a number of program features are classified in the user profile 300. For example, if a given viewer watched a given sports program ten times on Channel 2 in the late afternoon, while in a happy mood, then the positive counts (happy) associated with these features in the implicit viewer profile 300 would be incremented by 10 in field 345, and the negative counts would be 0 (zero). Since the implicit viewing profile 300 is based on the user's viewing history, the data contained in the profile 300 is revised over time, as the viewing history grows. Alternatively, the implicit viewer profile 300 can be based on a generic or predefined profile, for example, selected for the user based on his or her demographics.

FIG. 3B is a table illustrating an exemplary viewing history 360 that is maintained by a decision tree television recommender. As shown in FIG. 3B, the viewing history 360 contains a plurality of records 361-369 each associated with a different program. In addition, for each program, the viewing history 360 identifies various program features in fields 370-379. The values set forth in fields 370-379 may be typically obtained from the electronic program guide 130. It is noted that if the electronic program guide 130 does not specify a given feature for a given program, the value is specified in the viewing history 360 using a "?".

FIG. 3C is a table illustrating an exemplary viewer profile 300' that may be generated by a decision tree television recommender from the viewing history 360 set forth in FIG. 3B. As shown in FIG. 3C, the decision tree viewer profile 300' contains a plurality of records 381-384 each associated with a different rule specifying viewer preferences. In addition, for each rule identified in column 390, the viewer profile 300' identifies the conditions associated with the rule in field 391 and the corresponding recommendation in field 392.

For a more detailed discussion of the generating of viewer profiles in a decision tree recommendation system, see, for example, United States Patent Application Serial No. 09/466,406, filed December 17, 1999, entitled "Method and Apparatus for Recommending Television Programming Using Decision Trees," (Attorney Docket No. 700772), incorporated by reference above.

FIG. 4 is a flow chart describing an exemplary mood detection and profile update process 400. As shown in FIG. 4, the mood detection and profile update process 400 initially performs a test during step 410 to determine if an event has occurred to trigger the updating of the viewer profile 300, such as the end of a program or the selection of a new program channel. If it is determined during step 410 that event has not occurred to trigger the updating of the viewer profile 300, then program control returns to step 410 until such an event is detected.

If, however, it is determined during step 410 that an event has occurred to trigger the updating of the viewer profile 300, then the current mood(s) of the viewer 140 are detected during step 420 using known facial expression analysis techniques, such as those described in "Facial Analysis from Continuous Video with Application to Human-Computer Interface," Ph.D. Dissertation, University of Illinois at Urbana-Champaign (1999); or Antonio Colmenarez et al., "A Probabilistic Framework for Embedded Face and Facial Expression Recognition," Proc. of the Int'l Conf. on Computer Vision and Pattern Recognition," Vol. I, 592-97, Fort Collins, Colorado (1999), each incorporated by reference herein. The intensity of the facial expression may be obtained, for example, in accordance with the techniques described in United States Patent Application Serial Number 09/705, 666, filed November 3, 2000, entitled "Estimation of Facial Expression Intensity Using a Bi-Directional Star Topology Hidden Markov Model," (Attorney Docket No. 701253), assigned to the assignee of the present invention and incorporated by reference herein. Generally, facial expression analysis detect the viewer's face in the field of view of the camera included in the audio/visual capture devices 150, and identify the particular facial expression exhibited by the viewer 140, such as a smile or frown. The facial expression is used to derive the current mood of the viewer 140.

A test is performed during step 425 to determine if the television programming recommender 100 is a Bayesian recommender or a decision tree (DT) recommender. If it is determined during step 425 that the television programming recommender 100 is a Bayesian recommender, then the positive counts corresponding to the current mood(s) of the viewer 140 are updated in the viewer profile 300 during step 430 for the program features associated with the current program. In addition, the negative counts are optionally updated in the viewer profile 300 during step 430 for the program features associated with one or more randomly selected programs that are not watched.

If, however, it is determined during step 425 that the television programming recommender 100 is a decision tree (DT) recommender, then the rules in the viewer profile

300' are filtered during step 450 to identify only those rules associated with the current mood. Thereafter, the remaining rules (after filtering) are further processed to identify the rules that are satisfied by the current program. The current program is then added to the identified rules during step 470, as follows:

$$\text{New Score} = \text{Current Score} + \left[\frac{1 \text{ New Program}}{\text{Total \# Programs Covered by Rule}} \; x \; \text{Indicated Strength} \right]$$

where, the strength can have a value of 7 for a happy mood, 1 for a sad mood and 3 for a neutral mood. Alternatively, the viewer profile 300' of FIG. 3C can be updated during step 470 by adding the watched program to the viewing history 360 and rebuilding the profile 300'. Thereafter, program control terminates.

FIG. 5 is a flow chart describing the mood-based recommendation process 500 embodying principles of the present invention. The mood-based recommendation process 500 utilizes the mood-based viewing preferences developed by the mood detection and profile update process 400 to generate program recommendations based on the derived current mood of the viewer.

As shown in FIG. 5, the mood-based recommendation process 500 initially obtains the electronic program guide (EPG) 130 during step 510 for the time period of interest. Thereafter, the appropriate viewer profiles 300 are obtained for the viewer during step 515. The mood-based recommendation process 500 then derives the current mood of viewer during step 520 using the audio/visual capture devices 150, in the same manner described above for the mood detection and profile update process 400.

A test is performed during step 525 to determine if the television programming recommender 100 is a Bayesian recommender or a decision tree (DT) recommender. If it is determined during step 525 that the television programming recommender 100 is a Bayesian recommender, then a recommendation score is calculated for each program using the feature counts only for the current mood(s) during step 530.

If, however, it is determined during step 525 that the television programming recommender 100 is a decision tree (DT) recommender, then the rules in the viewer profile 300' are filtered during step 540 to identify only those rules associated with the current mood. Thereafter, the remaining rules (after filtering) are applied to all the programs in the time period of interest during step 550. A score is retrieved for each program from field 392 of the profile 300' corresponding to the first satisfied rule in the ordered list of the profile 300'.

Finally, the user is presented with the calculated recommendation score for each program during step 570, before program control terminates.

It is to be understood that the embodiments and variations shown and described herein are merely illustrative of the principles of this invention and that various modifications may be implemented by those skilled in the art without departing from the scope and spirit of the invention.

CLAIMS:

1. A method for recommending one or more items, comprising the steps of:
obtaining a list of available items (130);
determining a current mood of a user (140); and
generating a recommendation score for at least one of said available items (130) based on said current mood.

2. The method of claim 1, wherein said current mood is determined using facial expression processing techniques.

3. The method of claim 1, wherein said current mood is determined using audio and/or video processing techniques.

4. The method of claim 1, wherein said current mood is determined by querying said user (140).

5. The method of claim 1, wherein said one or more items are programs, content or products.

6. A method for generating a user profile (300) indicating preferences of a user (140), comprising the steps of:
monitoring one or more items that are selected by said user (140);
determining a current mood of a user (140) during said selection; and
recording an indication of said current mood with said item selection in said profile.

7. The method of claim 6, wherein said user profile (300) is associated with a program content recommender (100).

8. The method of claim 6, wherein said step of recording an indication of said item selection further comprises the step of incrementing one or more positive feature counts associated with said item and said current mood.

9. The method of claim 6, wherein said current mood is determined by querying said user (140).

10. The method of claim 6, wherein said one or more items are programs, content or products.

11. A system (100) for recommending one or more items, comprising:

a memory (110) for storing computer readable code; and

a processor (120) operatively coupled to said memory (110), said processor (120) configured to:

obtain a list of available items (130);

determine a current mood of a user (140); and

generate a recommendation score for at least one of said available items (130) based on said current mood.

12. The system (100) of claim 11, wherein said current mood is determined using audio and/or video processing techniques.

13. The system (100) of claim 11, wherein said current mood is determined by querying said user (140).

14. A system (100) for generating a user profile (300) indicating preferences of a user (140), comprising:

a memory (110) for storing computer readable code; and

a processor (120) operatively coupled to said memory (110), said processor (120) configured to:

monitor one or more items that are selected by said user (140);

determine a current mood of a user (140) during said selection; and

record an indication of said current mood with said item selection in said profile.

15. The system (100) of claim 14, wherein said processor (120) is further configured to increment one or more positive feature counts associated with said item and said current mood.

16. The system (100) of claim 14, wherein said one or more items are programs, content or products.

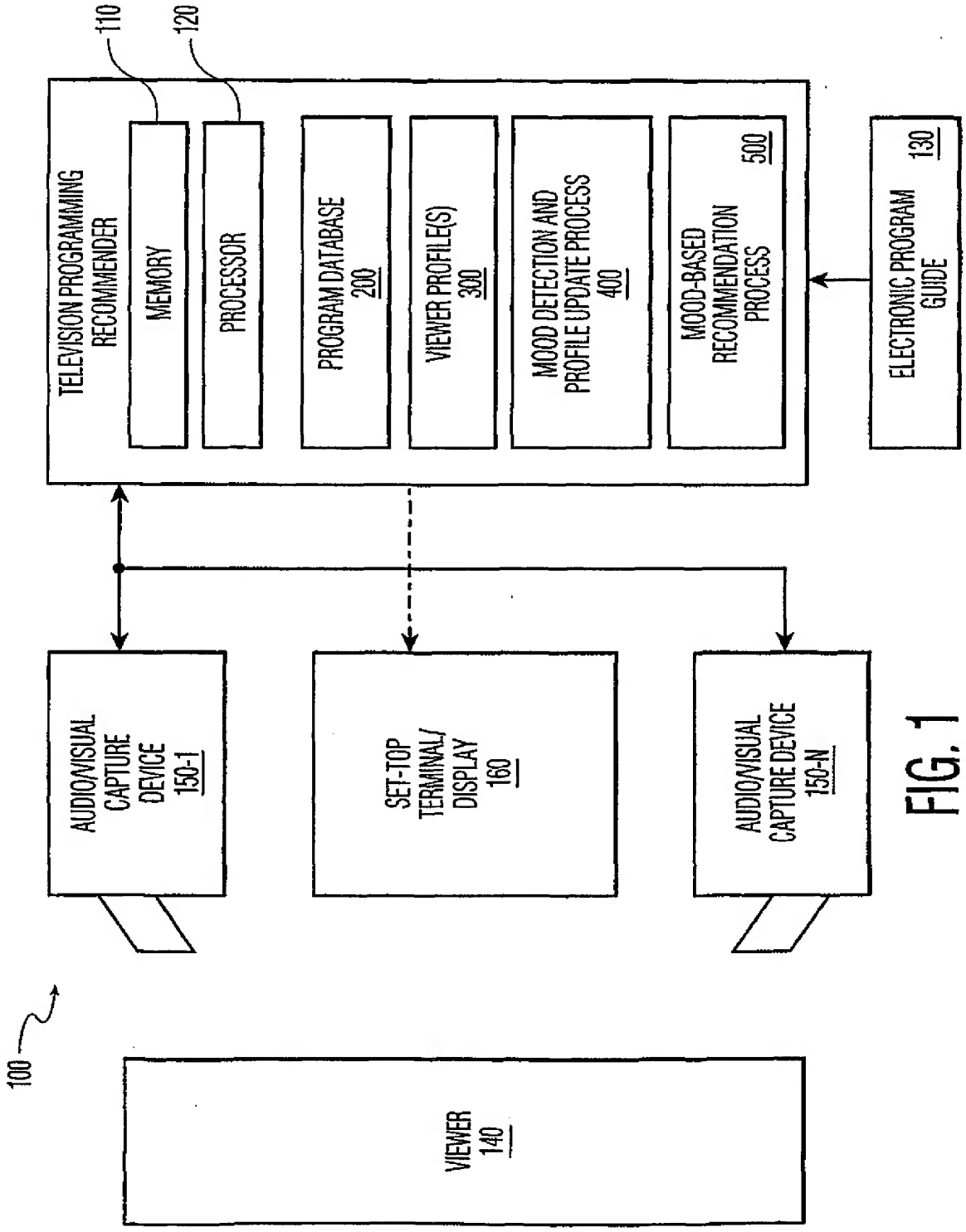

FIG. 1

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PROGRAM DATABASE - 200

	DATE/TIME 240	CHANNEL 245	TITLE 250	GENRE 255	...	ACTOR 270
205	11/18/99 – 8:00 P.M.	CH1	LUCY	COMEDY		CLINT DENIRO
210	11/18/99 – 8:30 P.M.	CH1	AL'S FAMILY	SITCOM		JENNIFER COX
	...					
220	11/18/99 – 9:00 P.M.	CH3	YOUR HOUSE	DRAMA		LUCY VANCE

FIG. 2

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IMPLICIT VIEWER PROFILE 300

	FEATURE 330	POSITIVE COUNTS: HAPPY 335	POSITIVE COUNTS: SAD 340	...	POSITIVE COUNTS: ANGRY 345	NEGATIVE COUNTS 350
305	TOTAL PROGRAMS	45				45
306	CHANNEL 2	10				0
307	CHANNEL 4	3				1
308	CHANNEL 7	4				4
	...					
309	SPORTS CHANNEL	10				0
...	MUSIC CHANNEL	1				0
	...					
310	MORNING PROGRAMS	2				2
311	EARLY AFTERNOON PROGRAMS	1				2
312	LATE AFTERNOON PROGRAMS	10				0
313	EVENING PROGRAMS	6				4
	...					

FIG. 3A

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VIEWING HISTORY 360

	TIME 370	TV RATING 371	SEX RATING 372	VIOLENCE RATING 373	LANG. RATING 374	STATION 375	TITLE 376	GENRE 1 377	...	GENRE N 378	...	CLASS 379
361	1930	TVPG	N	N	N	WPAX	SNFLD	COMEDY		SITUATION		SAD
362	2000	TVG	N	N	N	WPAX	6TH HEAV.	DRAMA		FAMILY		NEUT.
363	1900	TVPG	N	N	N	WPAX	FRIENDLY	COMEDY		SITUATION		SAD
364	2200	?	N	N	N	MAX	STEALTH	ACTION		?		HAPPY
365	2200	TVPG	N	N	N	FIM	EDITION	ADVENTURE		ACTION		HAPPY
	...											
366	0530	?	N	N	N	ASPN	RACEHORSE	NON-EVENT		?		NEG
367	1400	?	N	N	N	TCL	FORENSIC	?		?		NEG
368	0930	?	N	N	N	TVL	HITCHCOCK	SUSPENSE		CLASSIC		NEG
369	0730	TVPG	N	N	N	WPAX	PLANET WAR	CHILDREN		ANIMATED		NEG

FIG. 3B

VIEWER PROFILE 300'

	RULE IDENTIFIER 390	CONDITIONS 391	RECOMMENDATION 392
381	RULE 1	TIME > 1830 & TIME <= 1930 & TV_RATING=TVPG & STATION = WPIX	SAD [98.5%]
382	RULE 2	TIME = 2200 & TV_RATING = TVPG & (GENRE1 | GENRE2) = ACTION	HAPPY [96.5%]
383	RULE 3	GENRE1 = DRAMA	NEUTRAL
...			
384	RULE N	DEFAULT	NEG [100.0%]

FIG. 3C

BNSDOCID: <WO_____0243391A1_I_>

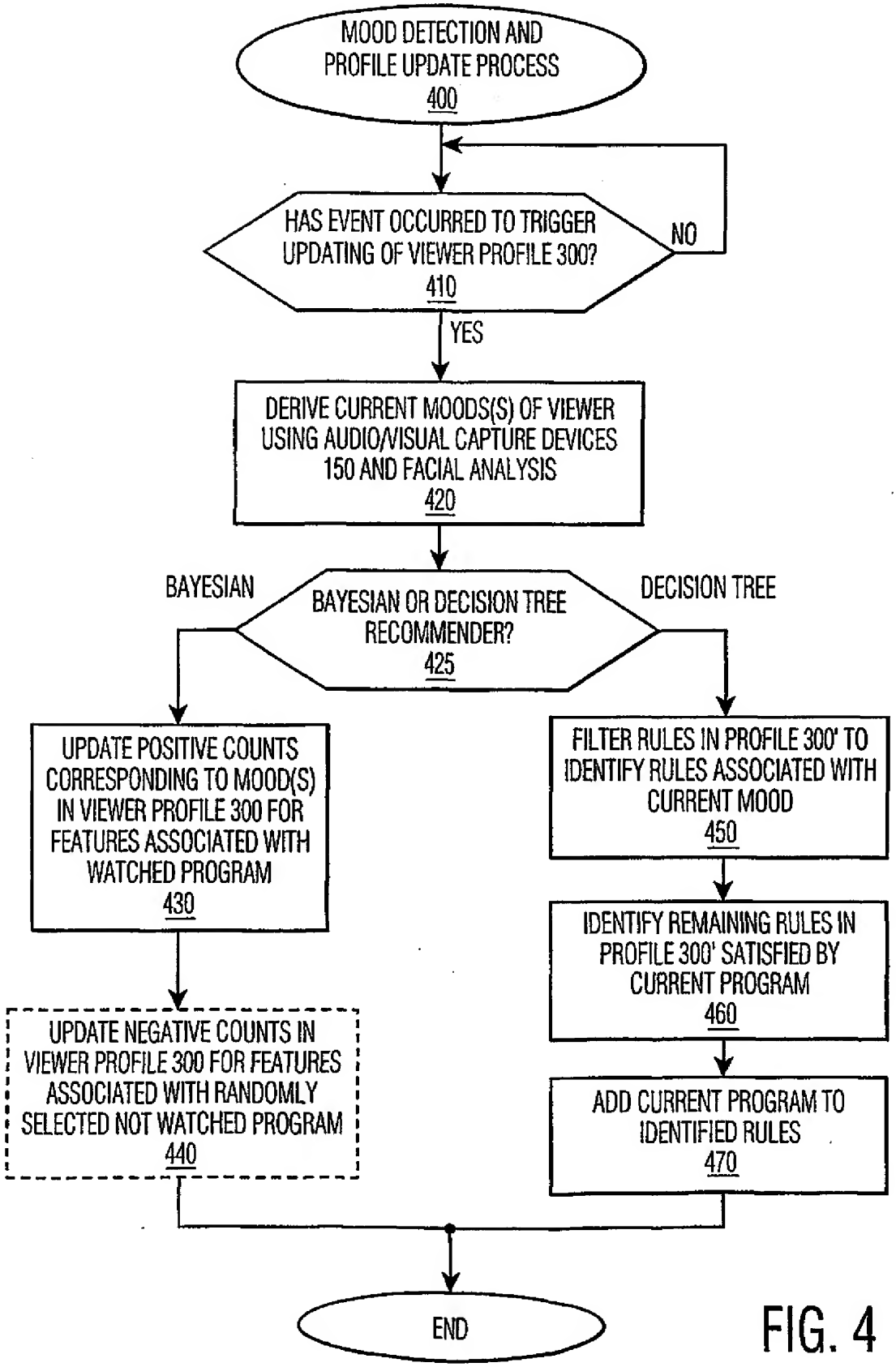
MOOD DETECTION AND PROFILE UPDATE PROCESS 400
HAS EVENT OCCURRED TO TRIGGER UPDATING OF VIEWER PROFILE 300? 410
NO
YES
DERIVE CURRENT MOODS(S) OF VIEWER USING AUDIO/VISUAL CAPTURE DEVICES 150 AND FACIAL ANALYSIS 420
BAYESIAN OR DECISION TREE RECOMMENDER? 425
BAYESIAN
DECISION TREE
UPDATE POSITIVE COUNTS CORRESPONDING TO MOOD(S) IN VIEWER PROFILE 300 FOR FEATURES ASSOCIATED WITH WATCHED PROGRAM 430
UPDATE NEGATIVE COUNTS IN VIEWER PROFILE 300 FOR FEATURES ASSOCIATED WITH RANDOMLY SELECTED NOT WATCHED PROGRAM 440
FILTER RULES IN PROFILE 300' TO IDENTIFY RULES ASSOCIATED WITH CURRENT MOOD 450
IDENTIFY REMAINING RULES IN PROFILE 300' SATISFIED BY CURRENT PROGRAM 460
ADD CURRENT PROGRAM TO IDENTIFIED RULES 470
END

FIG. 4

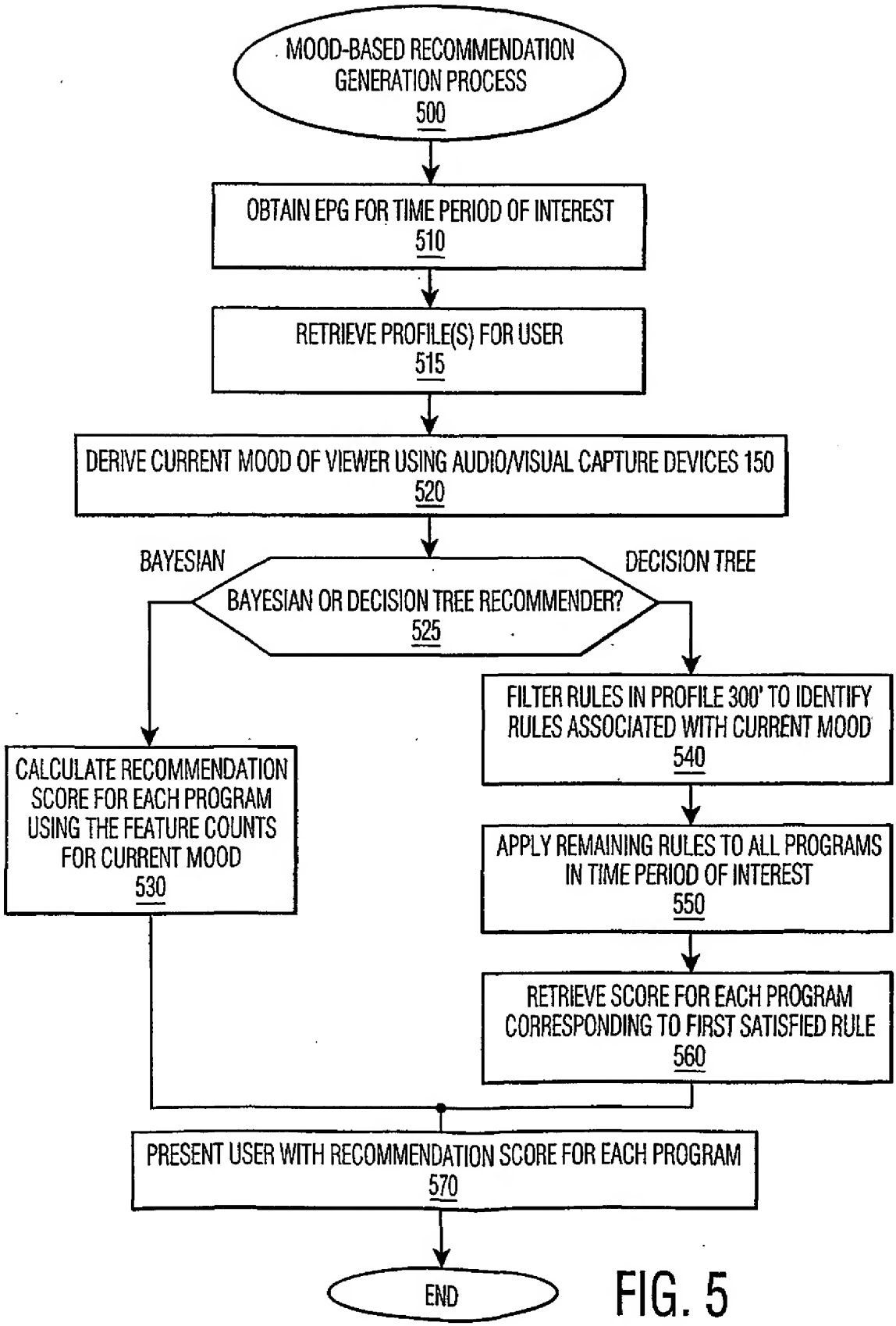
MOOD-BASED RECOMMENDATION GENERATION PROCESS
500
OBTAIN EPG FOR TIME PERIOD OF INTEREST
510
RETRIEVE PROFILE(S) FOR USER
515
DERIVE CURRENT MOOD OF VIEWER USING AUDIO/VISUAL CAPTURE DEVICES 150
520
BAYESIAN
DECISION TREE
BAYESIAN OR DECISION TREE RECOMMENDER?
525
FILTER RULES IN PROFILE 300' TO IDENTIFY RULES ASSOCIATED WITH CURRENT MOOD
540
CALCULATE RECOMMENDATION SCORE FOR EACH PROGRAM USING THE FEATURE COUNTS FOR CURRENT MOOD
530
APPLY REMAINING RULES TO ALL PROGRAMS IN TIME PERIOD OF INTEREST
550
RETRIEVE SCORE FOR EACH PROGRAM CORRESPONDING TO FIRST SATISFIED RULE
560
PRESENT USER WITH RECOMMENDATION SCORE FOR EACH PROGRAM
570
END

FIG. 5

INTERNATIONAL SEARCH REPORT

Inter[illegible]al Application No
PC[illegible]P 01/13453

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/16 G06T7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06K G06T H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, EPO-Internal, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GUTTA S ET AL: "TV CONTENT RECOMMENDER SYSTEM" PROCEEDINGS SEVENTEENTH NATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE (AAAI 2000), AUSTIN, TX, USA, 30 July 2000 (2000-07-30) - 3 August 2000 (2000-08-03), pages 1121-1122, XP001031541 the whole document --- -/--	1-16

[X] Further documents are listed in the continuation of box C. [ ] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search	Date of mailing of the international search report
28 February 2002	11/03/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bouchaâla, N

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	HANSEN J P ET AL: "Eye-gaze control of multimedia systems" PROCEEDINGS OF THE SIXTH INTERNATIONAL CONFERENCE ON HUMAN-COMPUTER INTERACTIONS (HCI INTERNATIONAL'95), SYMBIOSIS OF HUMAN AND ARTIFACT. FUTURE COMPUTING AND DESIGN FOR HUMAN-COMPUTER INTERACTION, TOKYO, JAPAN, 9-14 JULY 1995, pages 37-42 Vol.A , XP008001050 1995, Amsterdam, Netherlands, Elsevier, Netherlands ISBN: 0-444-81795-6 section 3 ---	1,3-16
Y	KANEKO M ET AL: "Processing of face images and its applications" IEICE TRANSACTIONS ON INFORMATION AND SYSTEMS, MARCH 1999, INST. ELECTRON. INF. & COMMUN. ENG, JAPAN, vol. E82-D, no. 3, pages 589-600, XP001032065 ISSN: 0916-8532 section 5.3.1 ---	2
A	NAKATSU R ET AL: "Emotion recognition and its application to computer agents with spontaneous interactive capabilities" HUMAN-COMPUTER INTERACTION: ERGONOMICS AND USER INTERFACES. PROCEEDINGS OF HCI INTERNATIONAL '99 (8TH INTERNATIONAL CONFERENCE ON HUMAN-COMPUTER INTERACTION), pages 142-146 vol.2, XP008001048 1999, Mahwah, NJ, USA, Lawrence Erlbaum Associates, USA ISBN: 0-8058-3391-9 the whole document ---	1-16
A	EDWARDS A D N: "Progress in sign language recognition" WORKSHOP PROCEEDINGS, GESTURE AND SIGN LANGUAGE IN HUMAN-COMPUTER INTERACTION, BIELEFELD, GERMANY, 17-19 SEPT. 1997, pages 13-21, XP008001046 1998, Berlin, Germany, Springer-Verlag, Germany ISBN: 3-540-64424-5 section 5 -----	1-16